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Two groups of institutionalized public school educable mentally retarded (EMR) children were matched with two groups of average children for mental age (MA, range 60 to 80), and chronological age (CA, range 10 to 14 years) respectively. Each group of 20 subjects completed a modified cloze task. When performances were compared as functions of position of deleted words, sentence types, and grammatical form class of deleted words, results gave a significantly lower mean percent of grammatically meaningful responses for retarded groups ($p<.01$). All groups performed best when the last word of the four-word sentences were deleted, and the retarded subjects' performance was relatively better than that of matched normal subjects. It was concluded that sequential strategies in processing sentences are probably more characteristic of retarded children than grammatical strategies. Form class was a significant variable ($p<.01$), and a significant interaction ($p<.01$) was found between form class and groups with the EMR children from the public school lower than the CA normal group on all form classes ($p<.01$) and lower than the MA normal group on verbs (P .05) and adjectives (P .01) but not nouns. Of the two retarded groups, the institutionalized mean was significantly lower (p .01), probably because of a more depressed language environment. (Author/SN)

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The Performance of Educable Mentally Retarded and Normal Children on a Modified Cloze Task[1]

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2 groups of educable mentally retarded children (institutionalized--I-R, and public school--PS-R) were matched with 2 groups of average children for MA or CA respectively. Each group completed a modified Cloze task. Performance as a function of position of deleted word, sentence type, and grammatical form class of deleted words was compared. Results indicated a significantly lower mean per cent of grammatically meaningful responses for retarded groups than for average Ss. Position of deleted words interacted with group performance. All groups performed best when the last word of the 4 word sentences was deleted. Retarded Ss' performance was relatively better on the last position than on other positions when compared to the equal CA and equal MA normal Ss. While sentence type did not interact with group performance, a significant main effect was obtained on this variable. Form class was found to be a significant variable in Cloze performance. A significant interaction was found between form class and groups. The I-R group performed more poorly in supplying adjectives than did Ss in other groups. A moderate correlation (r = .52) was found between performance on the Cloze task and the frequency of paradigmatic responding on a previously administered W-A task.

Several writers have suggested characteristic deficits in the language behavior of mentally retarded (MR) children (McCarthy, 1964; Spradlin, 1963). Dever (1966) recently contended that defects in grammatical coding skills may restrict the acquisition of vocabulary in MR children. Following Osgood's (1957) mediation model, Bateman and Wetherell (1965) presented data from the Illinois Test of Psycholinguistic Abilities (ITPA) which they interpreted as reflecting a characteristic weakness in the MR child's ability to "use the structure of language (grammar) automatically" and a particular problem in the "entire automatic-sequential level" of psycholinguistic functioning (e.g., auditory and visual sequencing).

Jakobson and Halle (1956) have postulated two specific dimensions of language: the paradigmatic and syntagmatic modes. The paradigmatic mode involves the ability to substitute one linguistic unit for another in any language context. Hence, such functioning implies the coding of linguistic units into grammatical classes--any unit retrieved from a given class shares a similar privilege of occurrence within an utterance frame with any other unit from that class.

The syntagmatic mode is said to control the ability to sequence linguistic units. While the two modes are synchronized in normal adult language, there is growing evidence to indicate a developmental shift from the early predominance of syntagmatic (sequential) functioning in young children to paradigmatic control (Entwisle, Forsyth, & Muuss, 1964; Ervin, 1961; Brown & Berko, 1960). Jakobson and his associates have described specific aphasic disorders in adult patients wherein either a characteristic disruption of the paradigmatic processes (deficits in word-finding, labeling, and categorizing) or defects in syntagmatic processes (combining linguistic units, completing sentences, processing sequentially organized materials) are evidenced.

The relevance of Jakobson's work to understanding the nature of the language deficits of educable mentally retarded (EMR) children is of particular interest to the investigators. In an earlier study, Semmel et al. (1966) compared EMR and normal Ss on a free word-association (W-A) task. The results indicated significantly fewer responses falling within the same grammatical form class as the stimulus words (paradigmatic responses) from EMR children when compared to equal CA normal Ss. The results of the W-A study suggested a deficit among EMR children which might be characterized as a weakness in the organization of linguistic units into classes.

An organism with an inefficient system of organizing or retrieving linguistic input would be expected to have particular difficulty in supplying words deleted from sentence contexts since such a Cloze task is highly dependent upon the ability to retrieve words from grammatical form classes which share the privilege of occurrence of the deleted words. Words deleted at the end of a sentence should be relatively less dependent upon grammatical habits since the final position is probably more constrained by the antecedent sequence of semantic cues. Hence, the final word in a sentence frame is assumed to bear less information than words in other positions of a sentence. While we predicted that retarded children would have relatively more difficulty than normal children on the Cloze task, we qualified this hypothesis by further predicting that they would perform relatively better in furnishing words deleted from the final position of sentences than in other positions.

Cloze performance was also thought to be dependent upon the grammatical structure of the sentences used as well as the grammatical form class of the words deleted. Sentence forms having lower probability of occurrence than others

in a child's language environment or having relatively more complex deep syntactic structures should be more difficult to process. The number and nature of words contained in a given repertoire of linguistic classes should influence the probability of responses.

In this study the performances of EMR and normal children on a modified Cloze task (Taylor, 1953) were compared to test the above predictions. Ss were asked to supply words deleted from simple four-word sentences. The effects of the position of the deleted words, sentence types, and form class of the deleted words were of particular interest.

Method

Subjects. Table 1 presents the characteristics of the four subgroups used in this study.[2] The institutionalized EMR Ss (I-R subgroup) and public school EMR Ss (PS-R subgroup) were randomly selected from a CA range of 10-14 years, and an IQ range from 60-80 on individual intelligence tests. The normal Ss consisted of one subgroup randomly selected from a mental age range comparable to the retarded samples (MA-N subgroup), and a second subgroup selected from the same chronological age range as the two retarded subgroups (CA-N subgroup). There were 20 Ss in each subgroup, all of whom came from relatively low socioeconomic backgrounds, and had participated in the W-A study previously reported by the authors (Semmel, Barritt, Bennett, & Perfetti, 1966).

Insert Table 1 about here

Construction of sentences. Forty simple four-word sentences were constructed using five different orders of nouns, verbs, adjectives, and adverbs or prepositions. The five prototypes are shown in Table 2. One word was deleted from each of the 40 sentences so as to yield an equal number of deletions across sentence types for each of the four positions. The words used in the construction of the sentences were among the 2000 most commonly used by retarded children (Mein & O'Connor, 1960).

Insert Table 2 about here

Coding of responses. The two criteria used to code and categorize the Cloze data were grammaticality and meaningfulness, both in the context of the sentence frames used. Responses were first coded for agreement with traditional

(Latin) rules of grammar. The data were then coded for meaningfulness, which was operationally defined as follows: (a) the response makes "sense" in the sentence--the judge is able to perceive a non-idosyncratic meaning of the words, or the co-occurrence of the sentence components is reasonably common; (b) the addition of an article or preposition enables the judge to score the response as meaningful in the context of the sentence frame; (c) the response completes a prepositional or participial phrase, which without modification other than as permitted in (b) above, can be considered meaningful in the context of the sentence frame.

The coding procedure resulted in the following response categories:

1. Grammatical-meaningful (G-M). The response judged to meet all criteria for grammaticality and meaningfulness within the sentence context.

2. Grammatical-Non-meaningful (G-NM). The response judged to meet all criteria for grammaticality but fails to meet the criteria for meaningfulness within the sentence context.

3. Non-grammatical-meaningful (NG-M). The response fails to meet grammatical criteria but is judged to be meaningful within the sentence context.

4. Non-grammatical-non-meaningful (NG-NM). The response judged to be neither grammatical nor meaningful (includes all responses where S gives no response or indicates that he does not know the "correct" response).

5. Miscellaneous (M). The response fails to meet the criteria for inclusion in categories 1 through 4.

The coding of responses was accomplished independently by three graduate students. Coder reliabilities were estimated by computing the per cent agreement between judges. These ranged from 97.75% for the I-R subgroup to 99.21% for the CA-N subgroup.

Procedure. Each sentence was typed on a 5 x 8 card and presented orally while S looked at the printed equivalent. The deleted word in each sentence was replaced by a line of constant length. As the sentence was read, E presented a tone at the point where the word was deleted (in order to avoid saying "blank" or some other utterance which could have led to response bias).

S was introduced to the modified Cloze task as follows:

In this game I will show you these cards with sentences on them; but there will always be one word missing. The idea of the game is for you to say the missing word so that the sentence makes good sense. I'll say the sentence to you and when you hear this sound (tone), you'll know this stands for the missing word.

For example, if I say 'Let's _____(tone)_____ a game,' you could say 'play.' You should say only one word--not more than one. You can use either a long word or a short word--the size of the blank doesn't show how long a word should be.

Four practice sentences were given prior to presentation of the 40 experimental sentences to assure understanding of the task.

Results

Table 3 presents the mean percentage of responses falling within each of the categories into which the Cloze data were coded. Mean percentage of G-M responses was the principal dependent measure for this study. Unless otherwise noted, all subsequent analyses refer to this response category.

Insert Table 3 about here

Table 4 summarizes the results of the repeated measures analysis of variance design used to assess differences between subgroups as a function of the position of the deleted words in the sentences. Both the main effects of subgroups and positions were significant but qualified by a significant interaction between these variables.

Insert Table 4 about here

When pooling across all positions, Tukey tests revealed that the CA-N and MA-N subgroups were significantly more proficient in Cloze performance ($p < .01$) than both the PS-R and I-R samples. The means for the two normal samples did not differ significantly; and the two retarded groups did not differ significantly on mean per cent G-M scores.

Effects of position. Analysis of interaction effects (see Figure 1) revealed that the I-R subgroup mean was significantly lower ($p < .01$) than the CA-N at all positions, and significantly lower than the MA-N subgroup on all positions except Position 4. The I-R mean was significantly lower than the PS-R mean only for Position 1 ($p < .05$). The PS-R subgroup mean was significantly lower than the CA-N mean at Positions 1, 2, 3 ($p < .01$) and 4 ($p < .05$), and significantly lower than the MA-N mean at Positions 1 and 3 ($p < .05$).

Analyses of the significance of simple effects of positions within subgroups (see Figure 1) revealed that both the PS-R and the I-R subgroup means

for Positions 1, 2, and 3 did not differ significantly but were all significantly lower than Position 4 ($p < .01$). The MA-N subgroup mean for Position 2 was lower ($p < .05$) than Position 4. There were no reliable differences between position means within the CA-N subgroup.

Insert Figure 1 about here

Effects of sentence types. Analysis of variance revealed a significant main effect of sentence types ($F = 18.43/df\ 4,304/p < .01$). Sentence type did not significantly interact with subgroups (see Figure 2). Sentence Type I (Adjective-Adjective-Noun-Verb) was significantly more difficult to process across all subgroups than Type III ($p < .01$), and Types IV and V ($p < .05$). While the mean for Type I was lower than Type II, the difference did not achieve significance at the .05 level.

Insert Figure 2 about here

Effects of form class. The effects of the form class (nouns, verbs, adjectives) of the deleted words upon ability to process sentences were assessed through analysis of variance. Form class was found to be a significant variable ($F = 25.55/df\ 2,152\ p < .01$). However, a significant interaction effect between form class and subgroups was also evidenced ($F = 3.66/df\ 6,152/p < .01$). Figure 3 presents a graphic representation of the simple effects of form class for each subgroup. Tukey tests showed that the I-R subgroup means for all form classes were significantly lower than those for the CA-N and MA-N subgroups ($p < .01$). The PS-R subgroup was significantly lower than the CA-N on all form classes ($p < .01$), and significantly lower than the MA-N on verbs ($p < .05$) and adjectives ($p < .01$) but not nouns. The PS-R and I-R subgroups differed only on adjective performance where the I-R mean was significantly lower than the PS-R mean ($p < .01$).

Noun slots were the least difficult to fill and verbs most difficult when pooling across subgroups. However, the interaction analysis clearly indicated that the most marked differences between subgroups occurred in the adjective slots. Noun slots were responded to more accurately than adjectives only within the I-R subgroup ($p < .01$). Adjectives were significantly ($p < .05$) easier

to supply than verbs only in the CA-N and MA-N subgroups. Nouns were significantly ($p < .05$) easier to supply than verbs for all but the CA-N subgroup.

Insert Figure 3 about here

Sex and race analyses. No significant race or sex differences were revealed by simple two-way analyses of variance.

Correlations with word association data. Across all subgroups, a rank order correlation of .52 ($p < .01$) was obtained between G-M responses on the present Cloze task and frequency of paradigmatic responses obtained from the same Ss in a previous W-A study reported by the investigators (Semmel et al., 1965).

Type-Token ratio (TTR) analysis. A Type-Token ratio (TTR) analysis (total different responses over total responses) for each S revealed no significant differences between the subgroups on this variable. Mean TTRs for the four subgroups ranged from .81 to .87. The correlation of TTRs and per cent G-M responses was not significant ($r = -.05$).

A TTR consisting of the ratio of different G-M responses to the total number of G-M responses was calculated for the subgroups, for each deletion position. These results are summarized in Table 5.

Insert Table 5 about here

Verbatim responses. The constraints on the different positions in the sentences used were estimated by calculating the number of verbatim responses (VRs--viz., the number of responses given by Ss that were the actual words deleted from sentences by E) for each position across each subgroup. The results summarized in Table 6 show the individual mean VRs.

Insert Table 6 about here

Discussion

The modified Cloze procedure was used in this study because it was assumed that the ability to supply words deleted in sentences is largely dependent upon

the decoding of grammatical cues. This assumption was partially supported by the moderately high correlation found between the per cent G-M responses obtained in this study and paradigmatic responses obtained from the same Ss on a previously administered W-A task (Semmel et al., 1966). We predicted that retarded children would have particular difficulty with the Cloze task due to weak grammatical decoding strategies. The significant overall difference in mean performance scores for both the I-R and PS-R subgroups as compared to the MA-N and CA-N subgroups supported this prediction.

The significant differences found between the EMR Ss and the equal M-A younger normal children suggests more than a simple lag in language development due to retarded mental development. The results imply that intelligence may, in fact, not be as closely related to language development as is generally believed (see Lenneberg, 1967). Retarded children appear to demonstrate greater difficulty on the Cloze task than would be predicted from their mental ages.

It was assumed that Cloze performance is dependent upon the position in a sentence of the deleted word to be supplied by Ss. The last position in the sentences presented was thought to be relatively less dependent on grammatical cues and more constrained by sequential associative dependencies than other positions in the sentence. Position 4 in the present investigation was thought to be more constrained (have less information) for EMRs than other positions. It was hypothesized that if retarded children have weaker grammatical decoding habits they should perform relatively better at Position 4 than other positions. This prediction was supported by the results. To the extent that supplying a missing word at the end of a sentence can be considered a "sequential" task, it appears justified to contend, contrary to the view of Bateman and Wetherell (1965), that retarded children do take advantage of sequential cues toward approximating normal performance. The most significant difficulties revealed by our EMR Ss appear to be in taking advantage of bilateral and consequent syntactic and semantic cues when asked to supply missing words from sentence frames.

The TTR data indicated no differences between the subgroups in the variability of different responses on the Cloze task. Hence, it is unlikely that differences between subgroups on mean G-M scores can be attributed to a greater degree of perseverance from EMR Ss. Of particular interest, however, was the tendency for TTRs to decrease from Position 1 to 4. This trend lends further support for our contention that the semantic and syntactic cues antecedent to Position 4 operated to increase the constraints on that position. The

relatively lower TTR at Position 4 simply indicates that Ss emitted fewer different responses at this position--probably because the "meaning" of the antecedent string restricted the amount of information carried by the words deleted in the terminal positions. Analysis of the words supplied which corresponded to the actual words deleted by Es (VRs) offered further support for the above assumption in demonstrating a tendency for higher PVRs at the final position.

All subgroups performed best on the Type III sentence (Adjective-Noun-Verb-Adjective) and poorest on the Type I sentence (Adjective-Adjective-Noun-Verb). Since form class constituency of both sentence types was identical, the syntactic arrangement of the classes was apparently a significant variable. It should, however, be noted that the verbs of Type III were intransitive while those in Type I were generally transitive. Performance variance on sentence types may reflect the frequency of occurrence of these types in the natural language of the populations sampled. The double-adjective construction of Type I is relatively less common in standard English. There is also the possibility that the base syntactic structure of a Type I sentence is more complex than the other types. There is some evidence indicating that the Type I sentence construction has a different and more complex structure than the other sentences used.[2] Whatever the explanation, it is notable that nouns which in general were the easiest form class to supply for all Ss, were missed in the Type I sentence over four items as often as in the Type III sentence.

Another result of some interest is that deleted adjectives were particularly difficult for the I-R subgroup to supply while Ss in the three other subgroups showed poorest performance in supplying verbs. Although the form class of the deleted word was confounded with the position within the sentence and type of sentence, the form class results appear partially consistent with our view that facility with adjectives develops relatively late for retarded children. A repetoire of adjectives reflects enrichment and variety in language usage, therefore suggesting that the difference between the I-R and PS-R subgroups may be due to an institutionalization effect, i.e., perhaps institutional living represents a more constricted and depressed language environment for EMR children (see McCarthy, 1964).

To summarize, we speculate that EMR children have weak grammatical decoding habits. This deficit results in their being relatively more dependent

on simple associative relationships or transitional probabilities between linguistic units than on structural syntactic cues. Hence, sequential strategies in processing sentences are probably more characteristic of retarded children than grammatical strategies. This is not to say that EMR children are devoid of grammatical competence. Rather, the generative rules which are obviously present and utilized in their encoding of grammatical sentences do not appear to be as efficiently invoked toward efficient decoding performance when compared to normal children of the same or lower CAs.

Footnotes

[1]The research reported herein was performed in part under Contract OEC-3-6-061784-0508 with the U. S. Department of Health, Education, and Welfare, Office of Education, under the provisions of P.L. 83-531, Cooperative Research, and the provisions of Title VI, P.L. 85-864, as amended. This research report is one of several which have been submitted to the Office of Education as *Studies in language and language behavior, Progress Report V,* September 1, 1967.

[2]Personal communication with Dr. David McNeill.

Figure Captions

Fig. 1. Percent grammatical-meaningful responses as a function of position of word within the sentence for the four subgroups.

Fig. 2. Percent grammatical-meaningful responses for the four subgroups and five sentence types.

Fig. 3. Percent grammatical-meaningful responses as a function of grammatical form class of the missing word for the four subgroups.

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Table 1
Characteristics of the Four Subgroups
(N = 20 each subgroup)

Variable		Subgroup			
		I-R*	PS-R*	MA-N*	CA-N*
CA (Years)	Mean	11.76	11.80	8.08	11.69
	SD	1.17	1.09	1.08	1.00
	Range	10.00-13.67	10.00-13.33	6.33-10.25	10.25-13.75
MA (Years	Mean	8.25	8.17	8.21	11.93
	SD	1.07	.86	1.11	1.05
	Range	6.83-10.67	6.42-9.75	6.25-10.58	9.92-13.42
IQ	Mean	70.15	69.60	102.25	102.30
	SD	5.34	5.79	6.34	8.56
	Range	61-78	60-80	90-118	92-126
Sex	Males	9	10	10	10
	Females	11	10	10	10

* Each subgroup consisted of 12 Caucasian and 8 Negro Ss.

Table 2

Types of Sentences Used in the Cloze Procedure

Sentence Type	Order of Form Classes
I	Adjective-Adjective-Noun-Verb (A-A-N-V)
II	Adjective-Noun-Verb-Noun (A-N-V-N)
III	Adjective-Noun-Verb-Adjective (A-N-V-A)
IV	Noun-Verb-Adjective-Noun (N-V-A-N)
V	Verb-Preposition-Adjective-Noun (V-P-A-N)

Note: One sentence in Type V consisted of Verb-Adverb-Adjective-Noun.

Table 3

Means and Standard Deviations of Coded Categories for Subgroups

		G-M	G-NM	NG-M	NG-NM	Misc.
I-R	$\bar{X}$%	55.47	2.65	2.85	29.22	9.67
	SD	16.30	2.08	2.25	14.75	5.02
PS-R	$\bar{X}$%	65.58	2.38	2.39	18.34	11.13
	SD	17.17	1.71	1.75	12.06	6.09
MA-N	$\bar{X}$%	81.27	1.78	1.81	8.20	6.85
	SD	8.59	2.18	1.80	6.18	5.10
CA-N	$\bar{X}$%	90.49	.24	2.64	3.36	3.20
	SD	7.23	.06	1.50	4.14	3.36

G-M = Grammatical-Meaningful
G-NM = Grammatical-Non-meaningful
NG-M = Non-grammatical-Meaningful
NG-NM = Non-grammatical-Non-meaningful
Misc. = Miscellaneous (remaining responses)

Table 4

Summary of Analysis of Variance for Subgroups and Position of Deleted Words

Source	df	MS	F
Between Ss	79		
A (Subgroups)	3	19726.66	27.45**
Ss within groups	76	718.67	
Within Ss	240		
B (Positions)	3	8812.94	39.28**
AB	9	1236.53	5.51**
B x Ss within groups	228	224,34	

** Significant at < .01 level

Table 5

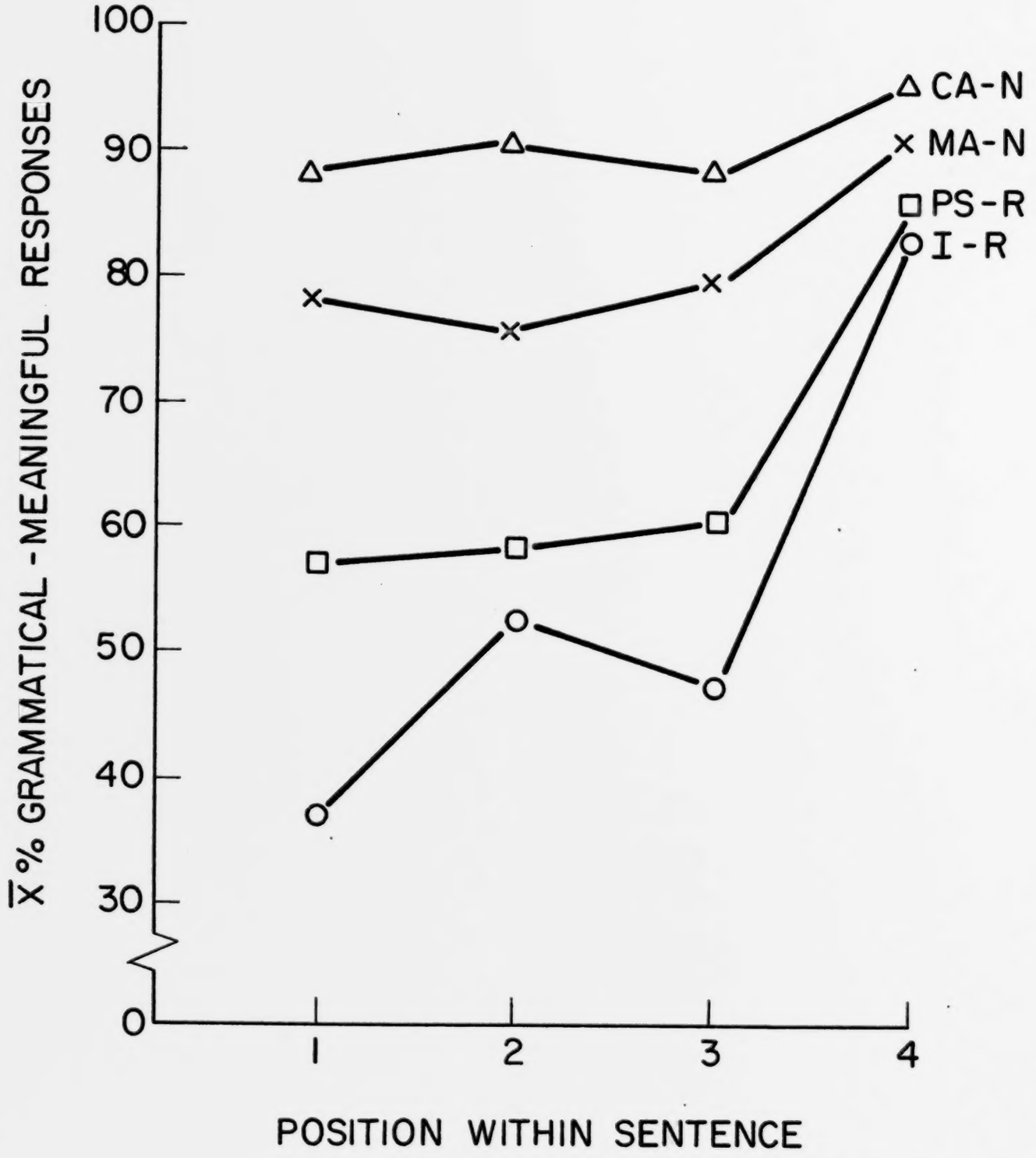
TTRs x Position for Subgroups

	1	2	3	4
I-R	.86	.78	.82	.74
PS-R	.89	.85	.73	.68
MA-N	.76	.72	.66	.68
CA-N	.71	.64	.56	.68

Table 6

Mean Number of Verbatim Responses by Position for Subgroups

Position	I-R	PS-R	MA-N	CA-N
1	0.5	0.7	1.55	1.80
2	2.05	1.55	2.45	3.40
3	1.60	1.75	3.20	4.10
4	2.90	2.80	3.25	3.25


100
90
80
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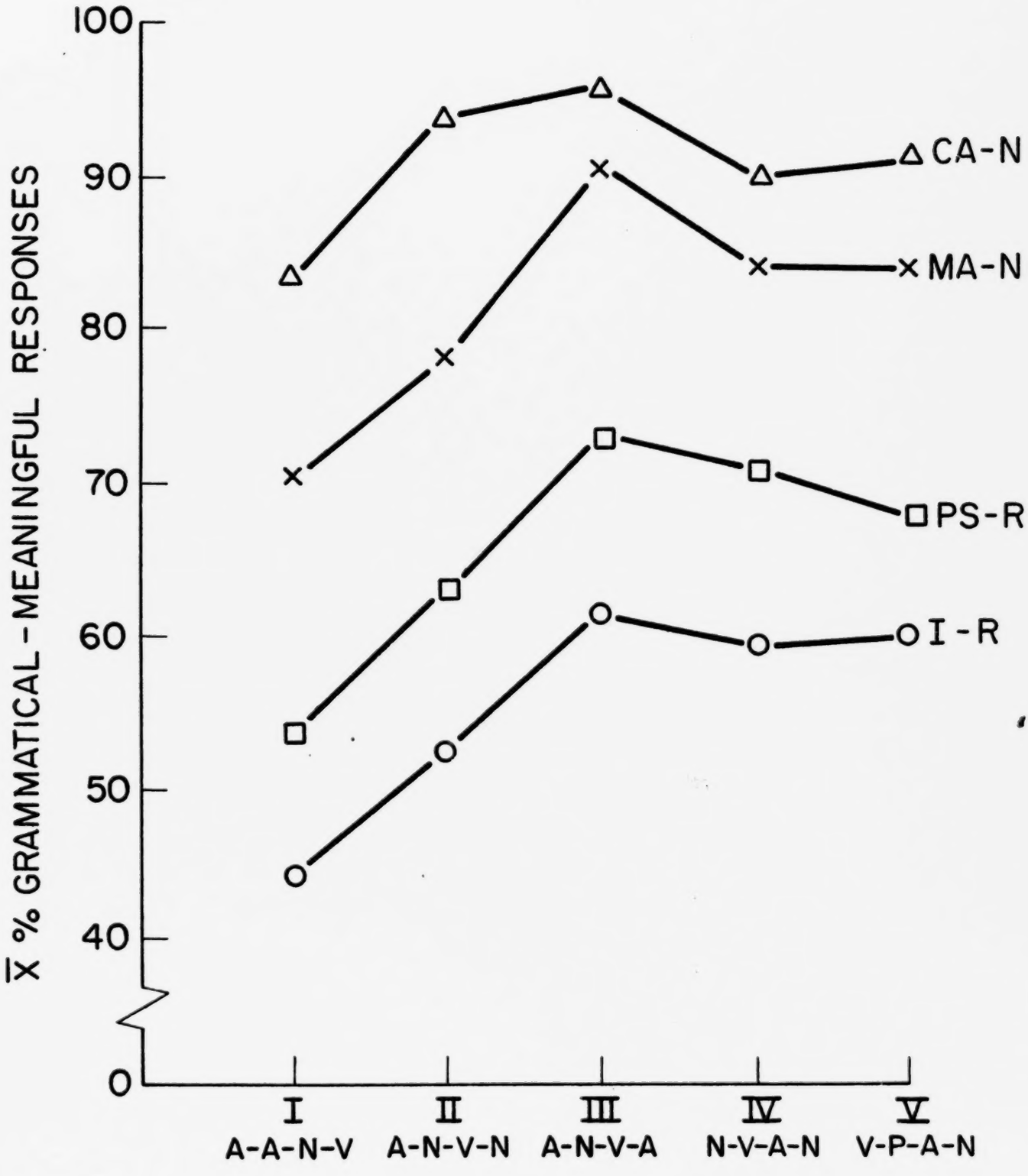
0
$\bar{X}$ % GRAMMATICAL - MEANINGFUL RESPONSES
CA-N
MA-N
PS-R
I-R
1
2
3
4
POSITION WITHIN SENTENCE

Figure 1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X̄ % GRAMMATICAL-MEANINGFUL RESPONSES
CA-N
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A-A-N-V
II
A-N-V-N
III
A-N-V-A
IV
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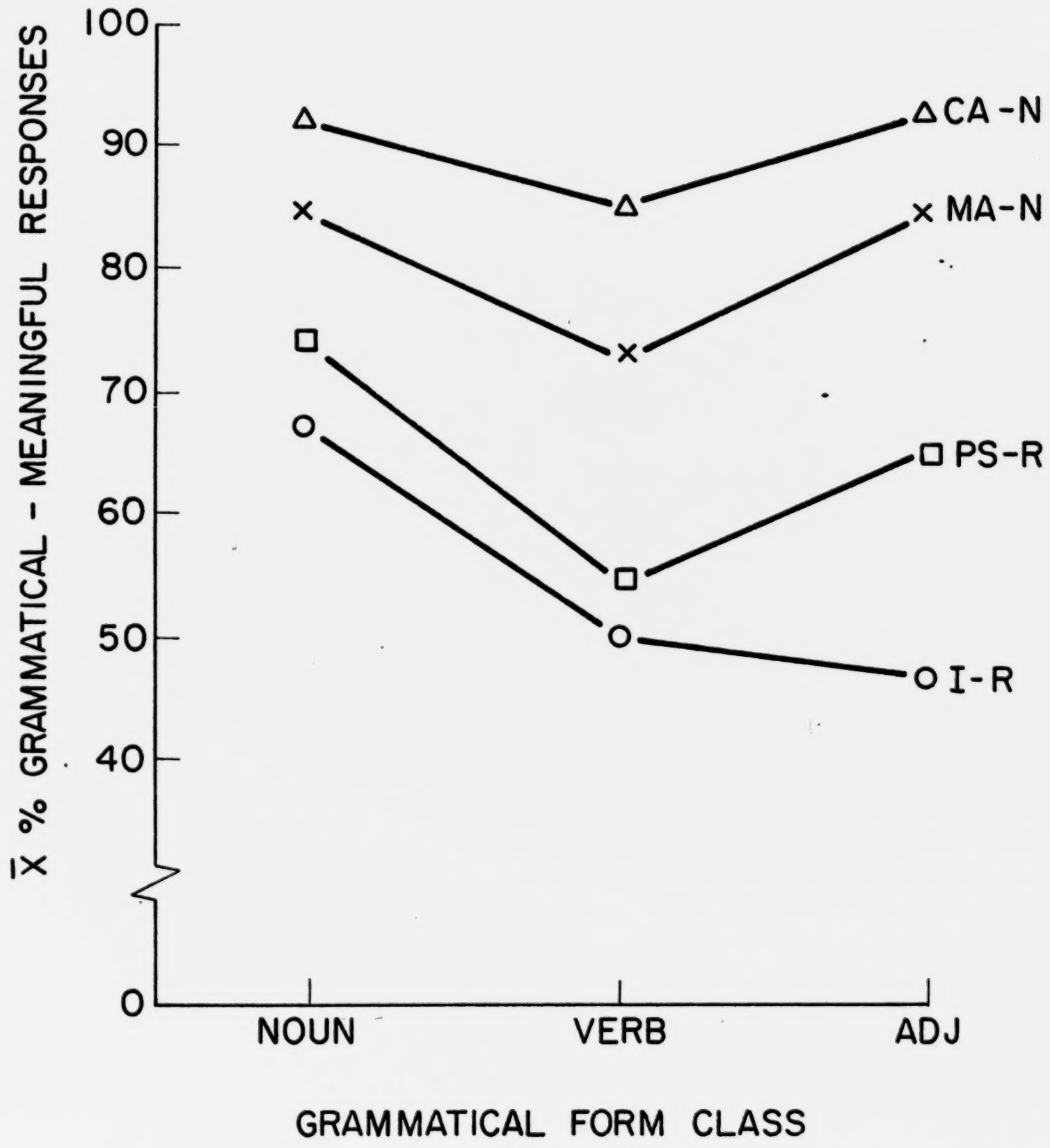
V-P-A-N
SENTENCE TYPES
N = NOUN V = VERB A = ADJECTIVE
P = PREPOSITION

Figure 2


100
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X̄ % GRAMMATICAL - MEANINGFUL RESPONSES
CA -N
MA-N
PS-R
I-R
NOUN
VERB
ADJ
GRAMMATICAL FORM CLASS

Figure 3